2017

Wastewater Treatment

ROBOX energy



# **ROBOX energy** - The Ideal Answer to **Wastewater Treatment** Variables

**The possibility** to adapt the software to suit a variety of process specifications, combined with greatly reduced electricity consumption and noise levels, is what makes Robuschi's ROBOX Energy the ideal technical solution for small-medium sized wastewater treatment plants with special needs.

Alto Trevigiano Servizi is a public utility set up in 2007 to manage the integrated water services for 53 municipalities in the provinces of Treviso, Vicenza, and Belluno, an area with approximately 500,000 inhabitants and 46 small-medium sized wastewater treatment plants. In recent years, the department that looks after the wastewater treatment plants (coordinated by Alberto Piasentin) has not only managed and actually run the plants, but also optimised the treatment processes. Here, environmental engineer Daniele Renzi, responsible fo optimisation, explains the specific work carried out on the sewer plant in Valdobbiadene (Treviso).

## VARIABLE NEEDS, FLEXIBLE ANSWERS

The Valdobbiadene plant was designed to

meet the needs of 10,000 people (Population Equivalent - PE), with an urban and industrial load applying a differential pressure of 390 mbar, with a capacity ranging from 400 to 1600 m<sup>3</sup>/h. It includes initial pre-treatment, a pre-denitrification phase followed by nitrification and oxidation, final sedimentation, and a sludge line that terminates with disposal for the formation of compost.

The biological plant was in need of modernisation, especially the air diffusion section, however there were several aspects that had to be taken into consideration. "The plant, serving a PE of around 5,000 - a lower figure than that envisaged by the initial project - has a seasonal nature" explains Renzi. "It's located in the area where Prosecco wine is produced and at the time of the harvest and when the winery is at its busiest, from late August to early November, there's a considerable increase in the organic burden entering the plant, to the point of reaching a PE of 10,000 with peaks of 13,000 on some days".

To manage both the seasonal surges and the daily variations, it is vital to use equipment that can guarantee flexibility in terms of air supply, pumping, and mixing capacity.

The solution to these requirements was **ROBOX energy**, the new permanent-mag-

net screw compressor from Robuschi.

### ROBOX energy - THE IDEAL SOLUTION

"In the air diffusion section", continues Renzi, "the system was already equipped with two twin-speed lobe blowers (also made by Robuschi) that worked fine and gave the right results, but were somewhat out-ofdate. So we decided to look for a compressor with more modern technology, able to overcome the limits of the existing ones. (that supply a precise amount of air, with very little room for flexibility). In this way, we managed to cover the supply peaks that are a typical feature of the Treviso plant." The refurbishment began at the end of 2016, immediately after the yearly overload period. Few interventions were needed to install the machine; building work was kept to a minimum, as was the work on the piping in order to connect the new compressor. "There were no problems from the point of view of the installation."

explains *Edi Casagrande*, a highly specialised technician involved in system maintenance for Alto Trevigiano Servizi, "as ROBOX energy is a compact, robust machine that's easy to insert in an existing wastewater treatment process. The two previous Robuschi blowers were kept on as spare machines, to ensure continuity even when maintenance needs to be carried out on the new addition."



There were no long shut-down times at any point of the installation phase. "We had to create specific temporary shut-off moments on the connection to the main air supply pipe, but the actual time taken to insufflate air in the wastewater treatment plant process was only a couple of hours. The electrical connections had already been prepared in advance, because ROBOX energy As Casagrande explains, "The operating modes are divided into two sequences: master and slave. In the first, the machine is autonomous. It stands alone. It's managed purely by a 4-20 mA signal brought directly to an analogue input, and by an oxygen probe positioned inside the biomass of the wastewater treatment plant to measure the amount of oxygen needed by the



has its own electronics so only needs to be joined up to an electricity supply line, then the signal cable is connected so that the compressor can be controlled on the basis of the system process parameters."

## TAILOR-MADE SOFTWARE

Working closely with the Robuschi technicians, Alto Trevigiano Servizi then set up the compressor software that allows the machine to be managed via remote commands, thanks to an automatic control system with intermittent ventilation (that can work alongside the Smart Process Control installed on ROBOX energy). The system that also makes the machine autonomous in the event of technical problems with the remote command function, thereby avoiding costly system shut-down time. process and, consequently, to adjust the cubic metres of air supply. In slave mode, the compressor is managed by means of the remote system, that provides stop-start sequences to create intermittent ventilation phases according to the system process requirements. This work sequence guarantees energy savings and a considerable reduction in the nitrogen components used in the biological process. If a fault arises on the external automatic control system however, the operating mode can be switched so that an operator on-site can intervene directly on the blower operator panel."

#### THE ADVANTAGES OF ROBOX energy

In both operating modes, the feature that the company noted straight away was the high degree of flexibility of ROBOX energy. Thanks to the permanent magnet technology, the system can work anywhere between a maximum capacity of about 1,600 m<sup>3</sup>/h and a minimum speed of a few hundred cubic metres, with greater flexibility compared with the operating range (between 1,600 and 880 m<sup>3</sup>/h) of existing systems. "We've set the minimum compressor limit at around 500 m<sup>3</sup>/h" says Renzi, "as the measurements taken on-site showed that this is the best point for maintaining the minimum adequate mixture in the oxidative compartment. In reality, the permanent magnet technology could enable the machine to work with even lower capacity levels."



"ROBOX energy has proved itself to be an innovative, flexible machine with highly adaptable software that can meet specific process needs"

says **Edi Casagrande**, plant maintenance technician at Alto Trevigiano Servizi.

In addition to improved flexibility, another aspect of the new Robuschi compressor that has caught the eye of the Alto Trevigiano Servizi operators is the simple, plug and play installation. It's a complete machine with a built-in electronic panel in the back, and a user-friendly front control panel. "We're often on the lookout for solutions that are technologically advanced but at the same time simple," says the engineer, "so that our operators can work with an



intuitive graphic interface and understand straight away which parameters they need to work on."

## **GUARANTEED SAVINGS**

The ROBOX energy compressor has been up and running for approximately six months. During the start-up phase following installation, the main parameters were monitored in order to define the capacity ranges and machine variation speed which the machine would need to work with. In these first few months, no problems - either electrical or mechanical - have arisen.

"To verify the benefits in terms of energy savings since the installation of ROBOX energy, two types of analysis have been carried out," explains Renzi, "before and after installation, we assessed the overall transfer coefficient of the dissolved oxygen of the air diffusion system, and it emerged that the average energy consumption data in terms of daily kWh of the new compressor compared with the previous ones was 15-20% less. That's an excellent result for a small system that works with pressure levels of 390 mbar."



#### A REWARDING CHOICE

"We're fully satisfied with this machine" says Renzi. "Apart from the fact that it's simple to install and manage, ROBOX energy guarantees stability - something that influences the process; it ensures flexibility, allowing it to be used in both small-medium sized systems like ours, and in higher capacity systems; it offers the perfect combination with the intermittent ventilation cycles; and, last but not least, it meets the specific needs of a seasonal system like Valdobbiadene that also has notable daily variations as well."

The engineer's concluding comments don't rule out the possibility of further collaboration with Robuschi in the future, to adopt ROBOX energy in other ATS projects. In fact, the focus on innovation displayed by Alto Trevigiano Servizi also includes a willingness to work alongside companies and research bodies that want to set up advanced technologies with environmental and financial benefits for the design and management of wastewater treatment plants.



"The decision to use ROBOX energy technology - Robuschi's new permanent magnet screw compressor - has met all the needs of the Valdobbiadene plant"

says **Daniele Renzi**, Manager of wastewater treatment process optimisation at Alto Trevigiano Servizi.

Pic. **1** - Compressor room with ROBOX energy Pic. **2** - Edi Casagrande with ROBOX energy

Pic. 3-4 - Valdobbiadene wastewater treatment plant



Pic. 4